What can we learn from IR spectroscopy?

- **Atoms vibrate with frequencies in the IR range**
- **Chemical Analysis:**
  - Match spectra to known databases
    - Identifying an unknown compound, Forensics, etc.
  - Monitor chemical reactions *in-situ*
- **Structural ideas:**
  - Can determine what chemical groups are in a specific compound
- **Electronic Information:**
  - Measure optical conductivity
    - Determine if Metal, Insulator, Superconductor, Semiconductor
    - Band Gaps, Drude model

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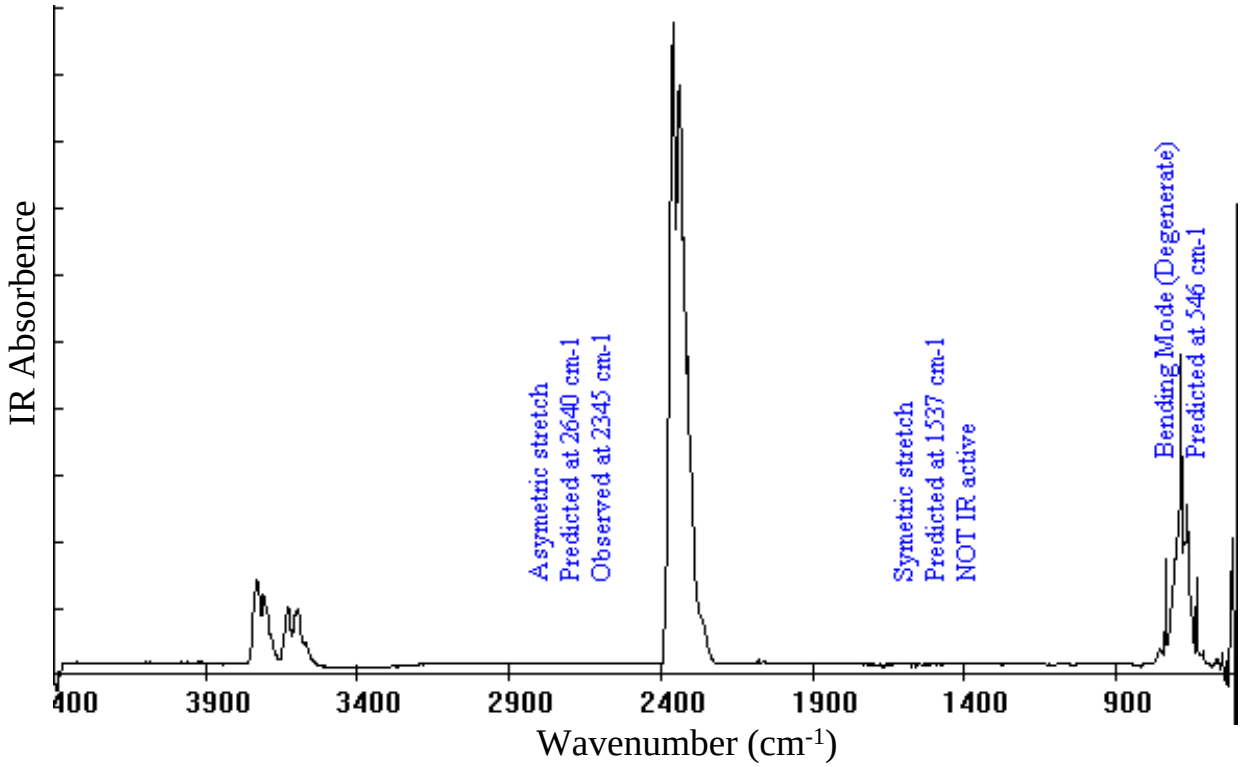
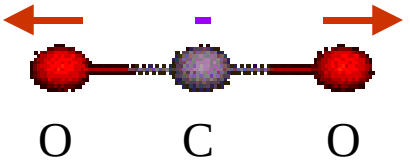
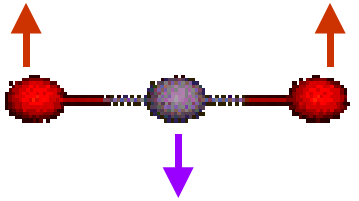
An Example: CO_2





Symmetric Stretch
(Dipole moment = 0 so **not** IR active)

Asymmetric Stretch
(Has dipole moment so IR active)



Bending Mode
(Has dipole moment so IR active)

A Dipole Moment = charge imbalance in the molecule